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GEOPHYSICAL ABSTRACTS

NO. XI.

BY

FREDERICK H. LEE

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INFORMATION CIRCULAR

DEPARTMENT OF COMMERCE -- BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. XI

Compiled by Frederick W. Lee[2]

TABLE OF CONTENTS

Page
1. Gravitational methods 2
2. Magnetic methods 8
3. Seismic methods 15
4. Electrical methods 16
5. Radioactive methods 22
7. Unclassified methods 23
Index of authors and subjects 26

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1. GRAVITATIONAL METHODS

ZUR MESSUNG DER HORIZONTALEN STÖRUNGSKOMPONENTE DES ERDMAGNETISCHEN FELDES

(ON THE MEASUREMENT OF THE HORIZONTAL DISTURBANCE-COMPONENT OF THE EARTH-MAGNETIC FIELD)

By H. Seblatnigg and A. Graf

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 329-331.

In this article the authors show the advantage of reading the measurements made with the horizontal balance, not in the direction of the magnetic north as is usual, but in the direction of a characteristic profile.

A practical example is discussed. A formula for the correction for the profile-direction is given and curves are drawn to show the values of measurements obtained by both methods.

The curves agree one with the other very well.--W. Ayvazoglou.

UEBER THEORETISCHE KIPPISOKLINEN UND HORIZONTALISODYNAMEN BY INDUKTIONS METHODEN

(ON THE THEORETICAL TILTED ISOCLINES AND HORIZONTAL ISODYNAMICS IN THE INDUCTION METHODS)

By A. Graf

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 331-334.

The normal pictures of the tilted isoclines and horizontal isodynamics are calculated theoretically under the assumption that the conductivity of the earth is homogeneous; but this assumed condition, as a rule, does not exist. How much these pictures are influenced by the tectonic masses, as well as the various deposits, is shown in parts of pictures representing the zones affected by the disturbances.--W. Ayvazoglou.

TWO GRAVITATIONAL SURVEYS IN SCOTLAND

By McLintock and James Phemister

The Iron and Coal Trades Review, vol. 119, No. 3,226, 1929, p. 981.

The Summary of Progress of the Geological Survey of Great Britain contains accounts of two gravitational surveys made in Scotland. One of these, entitled "A Gravitational Survey over the Buried Kelvin Valley at Drumry, near

Glasgow," has already appeared in the Transactions of the Royal Society of Edinburgh (See Geophys. Abs. No. 2); the authors' summary of the other, entitled "A Gravitational Survey over the Pentland Fault, near Portobello, Midlothian, Scotland," is given in the present article:

"1. The variation in the gradient determined along a series of traverses clearly indicates the existence of a fault accompanied by minor folding.

"2. The maximum gradients in each traverse have a high value and lie on a line which is parallel to the line of the Pentland Fault as plotted on the 6-inch Geological Survey map, and 180 yards east of it.

"3. The buried outcrop of the fault is close to the line of maximum gradient and its strike is at right angles, within 3 to 4° to the average direction of the gradients on each traverse.

"4. The fault is reversed and heads steeply towards the west or upthrow side; it strikes N.NE. to S.SW.

"5. The heavy horizon west of the fault is the Arthur's Seat lavas with a deduced specific gravity of 2.82. Their thickness, estimated from the values of the gradients, is 500 to 600 feet, and their depth below the surface at the fault is 150 feet; this depth is increased to fully 250 feet by sharp synclinal folding west of the fault. Reasons for possible qualifications of these figures are given in the paper.

"6. The strike of the minor folding west of the fault is deduced as almost due north and south.

"7. The strata immediately east of the fault are very steep and possibly reversed.

"8. The strike of the sedimentary rocks deduced from the gradients along the east traverse is practically the same as the strike observed in the nearest exposures.

"9. The outcrop of a dense stratum, probably the Gilmerton limestone, was located at 130 to 140 feet west of the inferred position of this limestone. The gravitational results in this area are so complicated that the authors doubt if this location would have been made unless the geology had been fairly accurately known.

"10. The absence of pronounced local anomalies in the gradients indicates that the surface between rock and drift is regular, as might be expected, since it forms part of a raised beach. Abrupt local changes in the thickness of the drift are indicated at two places; in the one case the presence of a buried channel, in the other, a buried cliff, is suggested. The average depth of drift in the area surveyed appears to be about 20 feet.

"11. Quantitative deductions were not made from the residual curvature values, but in several respects these afforded a valuable qualitative check on the deductions made from the gradients. The existence of the shallow structure on the south traverse, which may be a buried channel, was shown by the curvatures and not by the gradients."

The Eötvös torsion balance has been used in making the survey.--W. Ayvazoglou.

SUL CALCOLO DELLA PROFONDITA DI MASSE PROFONDE GRAVIMETRICAMENTE DISTURBANTI

(CALCULATIONS ON THE DEPTH OF SUBTERRANEAN MASSES BASED ON GRAVIMETRIC DISTURBANCE)

By A. Belluigi

Gerlands Beiträge zur Geophysik, vol. 21, No. 1, 1929, pp. 173-177.

The problem of a terrain reduction for a very general case is examined. Formulas for masses situated at great depths are derived, and a case occurring very often in practice is studied.--W. Ayvazoglou.

RELATIVE SCHWERKRAFTMESSUNGEN NACH DER REFERENZMETHODE MIT DRATHLOSER FERNSTEUERUNG DER KOINZIDENZ-APPARATE UND ERSTMALIGE MESSUNGSERGEBNISSE.

(RELATIVE GRAVITY MEASUREMENTS BY MEANS OF THE REFERENCE METHOD WITH THE REMOTE WIRELESS CONTROL OF THE COINCIDENCE-APPARATUSES, AND THE RESULTS OF THE FIRST MEASUREMENTS)

By Ernst Berger and Karl Mader

Gerlands Beiträge zur Geophysik, vol. 21, No. 4, 1929, pp. 355-365.

In the first part of this article Berger gives the description of the method and of an apparatus by which the control of the coincidence apparatuses and chronographs used for the measurements of the relative gravity is made possible by wireless.

Exact reference measurements can be made at any amount of stations; the coincidence-apparatuses of these stations are driven by the second-swings of one astronomical clock common to all stations.

In the second part (Results of the first measurements) of the paper Mader describes the practical application of the method and gives the results obtained by such a wireless reference-measuring of gravity.--W. Ayvazoglou.

GEOPHYSIKALISCHE PROBLEME DES RIESES

(GEOPHYSICAL PROBLEMS OF THE RIES-MOUNTAINS)

By H. Reich

Zeitschrift der Deutschen Geologischen Gesellschraft,
vol. 81, No. 3/4, 1929, pp. 99-109.

In this paper Reich examines the data established so far by magnetic and pendulum measurements to determine whether or not they are sufficient for the enlightenment of the Ries problem.

At the end of the article he brings up the question of what can be done by geophysics for the explanation of the Ries problem.

The results of gravity measurements made by different scientists since 1901 are summed up by the author as follows:

1. Ries is situated at the border of two large tectonic earth-masses: Alpenrandsenke-Süddeutsche Hochscholle.

2. A gravity foundation extends in the direction from W.SW. to E.NE. in the southern part of Ries; in the region of Ries it is broken into many parts.

3. Inside of Ries, in its northern part, there is a gravity deficit having the form of a crater.

The results of magnetic measurements are studied mainly from Haussmann's declination map of south Germany and are summed up as follows:

1. The magnetic anomalies of remote regions of Ries are probably caused by old crystalline mountain chains extending from E.NE. to W.SW.

2. This regional anomaly is disturbed in the region of Ries itself. A hole, having a crater form, is formed in the original rocks near Klosterzimmern --Dürrenzimmern--and the earth-masses are partly broken near Alerheim.

Thus in interpreting the geophysical conditions, regional effects must be distinguished from local effects. Only the local effects are connected with the real Ries problem.

The author is of the opinion that a very interesting and valuable picture of the composition and extent of crystallines may be obtained by means of a detailed gravimetric survey, and a still better one by means of magnetic investigations. Of course, additional magnetic and gravimetric measurements supported probably by seismic measurements are required in order to obtain reliable data.

In conclusion, Reich sums up his ideas on the Ries problem, as based on geophysical measurements and geological conditions, as follows:

"1. The volcanic structure of Ries is probably connected with the magnetic-tectonical proceedings at a great depth (similar to the Steinheim Basin and the region of Urach) which take place at the border of two large tectonic masses having various gravity relations and various tendencies of movement.

"2. The expansive magnetic anomalies extending into the remote surroundings of Ries are caused (similar to the gravity line extending to the south of Ries) by crystallines.

"3. This figure, which may be considered simple, is considerably disturbed by the later volcanic manifestations in Ries, as well as in the Steinheim Basin.

"In order to establish a reliable picture, further special investigations by the most modern geophysical means, especially by a magnetic survey, are necessary."

Five figures and a list of literature complete the article.--W. Ayvazoglou.

THE STATUS AND IMPORTANCE OF ISOSTASY

By William Bowie

Mining and Metallurgy, vol. 11, No. 278, 1930, pp. 93-95.

The idea set forth by Bowie that large gravity anomalies are due to the presence of abnormally light or heavy rocks close to the stations having the large anomalies, has received attention and has become at the present time evident by investigations made at many places, mentioned by the author, in which the presence of extra heavy or extra light material close to the surface under the gravity station has been proved to be the cause of large gravity anomalies.

In the paragraph discussing the effect of isostatic compensation, Bowie says that on the basis of the conclusion that gravity anomalies are caused to a large extent by the presence of extra heavy or extra light material close to the station, it is possible to discover with gravity data at least the major features of buried structure. The effect of the isostatic compensation of the local as well as the world-wide topography would be identical for two stations not more than 15 or 20 miles apart.

In the last part of the article the author promulgates a complete gravity survey of this country by which the science of geology and prospecting operations for oil and minerals would be greatly benefited.

He believes also that isostasy must be given full weight in all researches concerning the origin of mountains, plateaus, oceans, and continents, and the causes of earthquakes and volcanoes. The author concludes:

"The purely geodetic phases of isostasy will continue to be the subject of investigations by the geodesists. There is much more to learn and it is hoped that these further investigations based on greater masses of data will clarify a number of points which seem to some investigators to be rather obscure at the present time."--W. Ayvazoglou.

ZUR BEGRÜNDUNG DER LEHRE VON DER ISOSTASIE

(IN SUPPORT OF THE THEORY OF ISOSTASY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 22, No. 1/2, 1929, pp. 115-123.

By neglecting the terms of Bruns in the reduction of values of gravity, too great values for gravity over the oceans would be received, even when density below oceans and continents would be equal. Results hitherto received only by measurement of gravity, therefore, do not provide a basis for the known conclusion upon different distribution of masses below oceans and continents. In this way the theorem of isostasy is deprived of a chief point of support.—Author's abstract.

UEBER DIE WIRKUNG DER UNDULATIONEN AUF DIE GRÖSSE DER SCHEINBAREN SCHWERKRAFTSTÖRUNG

(ON THE EFFECT OF UNDULATIONS OF THE GEOID UPON THE VALUE OF THE APPARENT PERTURBATION OF GRAVITY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 22, No. 1/2, 1929, pp. 124-132.

The purpose of this article is to show that the effect of undulations of the geoid upon perturbations of gravity is four times greater than the effect exercised on gravity by oceanic and continental irregularities in the arrangement of masses. The proof is given in an example. Values of the undulations upon perturbation of gravity are calculated and shown in a table.—W. Ayvazoglou.

ISOSTASIE UND HAUPTTRAGHEITSACHSEN

(ISOSTASY AND THE PRINCIPAL AXES OF INERTIA)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 21, No. 1, 1929, pp. 103-111.

The problem of the changes of the principal moments of inertia of the earth, as well as of the position of its principal axes of inertia, caused by proceedings of isostatic reduction seeking an equalization of the irregular distribution of masses has been studied by several scientists (Jung, Mader, Schweydar), but a clear explanation of this complicated relationship has, in the opinion of the author, not been reached yet.

In this article Hopfner examines this problem and sums up his results as follows:

"Changes in the arrangement of the earth's masses produced by proceedings of isostatic reduction cause a considerable displacement of the principal axes of inertia in the equatorial plane of the earth, but the amount of this displacement can be computed with great uncertainty only."—W. Ayvazoglou.

DIE DREIACHSIGE ERDFIGUR UND DIE ISOSTASY

(THE THREE-AXIAL FIGURE OF THE EARTH AND ISOSTASY)

By Karl Mader

Gerlands Beiträge zur Geophysik, vol. 22, No. 3, 1929, pp. 318-326.

Mader formulates the question concerning the possibility of solving the problem of the reality of the ellipticity of the equator as follows:

"If there is no isostasy the difference of the moments of inertia at the equator must, owing to the irregularity of continents and seas, correspond to the difference of the semiaxes A and C of about 300 m.

"In case the isostatic compensation exists, the ellipticity at the equator, as derived from the formula of gravity, must be considered to be illusory, because the difference of A - C of the isostatic earth can in this case be not more than 20 meters."

Therefore the question whether the earth has a three-axial figure or not, can be solved only after the existence or nonexistence of isostasy is proved in some way. In one of his future works the author expects to give some detailed calculations on this question.

His present article Mader sums up as follows:

"The present state of the question relating to the three-axiality of the earth may best be solved under the condition that the visual irregularities of the masses of the earth's crust are considered to be not compensated for by isostasy. The difference of the moments of inertia at the equator caused by the irregularities of masses leads to a difference of the semiaxes A and C of the equator of the order of the value of 300 meters."--W. Ayvazoglou.

2. MAGNETIC METHODS

UNSERE HEUTIGE KENNTNISS UEBER DIE VERTEILUNG DES ERDMAGNETISMUS

(OUR PRESENT KNOWLEDGE OF THE DISTRIBUTION OF THE EARTH MAGNETISM)

By A. Nippoldt

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 351-358.

In consideration of the fact that studies of the constant field of earth magnetism are based on results obtained from the magnetic survey on land, and that clearness concerning the extent of the geographic distribution of the points at which observations have so far been made is of great importance, Nippoldt collected information on the total number of these points.

Nippoldt succeeded in establishing a total number of about 27,000 points, from which 4,000 observations have been made at sea. The general distribution of all these points over the whole world is given in a table and a map. The mean distance between the stations for single countries is calculated in kilometers.

Considering the present information on the magnetic survey insufficient for the solution of the earth magnetism field, the author suggests that new magnetic maps be drawn by the most modern means and without comparing them with the old maps. He proposes that the new original map should be provided with lines established by actual observations only, leaving the completion of the lines to scientists themselves in accordance with their purposes. Another map with lines continued over the whole world could, of course, be prepared for practical purposes also.

A brief criticism of the material collected is added.--W. Ayvazoglou.

UEBER DAS VORHANDENSEIN EINER MAGNETISCHEN WIRKUNG DURCH ROTIERENDE MASSEN UND DIE URSACHE DES ERD-UND SONNENMAGNETISMUS

(ON THE EXISTENCE OF A MAGNETIC INFLUENCE CAUSED BY ROTATING MASSES AND THE CAUSE OF THE EARTH AND SUN MAGNETISM)

By H. Haalck

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 359-366.

If a mass rotates about itself, the positive charges of the atom nucleus as well as the negative charges of the electrons are carried forward. The magnetic fields produced by the movement of the positive and negative quantities of electricity do not neutralize one another entirely, and the magnetic effect of the negative charges caused by the rotation of the body must prevail, owing to the movement of the electrons about the atom nuclei.

According to experimental researches, the magnetic effect produced by the rotating masses is smaller than the sensitiveness of the present measurement instruments. But there is a probability that, taking into consideration the temperatures and pressures existing inside of the earth, the atomic structure of matter is such that owing to this rotating-magnetic effect the existence of the earth magnetism may be produced.--Author's abstract translated by W. Ayvazoglou.

ERDMAGNETISCHE UNTERSUCHUNGEN IN DER GEGEND VON SAINT BOÈS (BASSES PYRÉNÉES)

(EARTH-MAGNETIC INVESTIGATION IN THE REGION OF SAINT BOÈS, LOWER PYRENEES)

By P. Geoffroy and B. Perebaskine

Petroleum Zeitschrift, vol. 26, No. 1, Jan., 1930, pp. 10-11.

An investigation by geophysical methods has been started to establish Triassic formations and their borders in the region of St. Boès. The magnetic method was selected and Haalck's and Schmidt's balances were used.

Notwithstanding the unfavorable conditions of work (anomaly values not exceeding γ, swampy ground, passing of an electric contimuous current line, and very rich vegetation) the results of investigation were successful, mainly owing to the following two very favorable conditions: (1) There were only two geological formations, the Cretaceous and the Triassic formation, and (2) the Cretaceous formation, by which almost the whole region was covered, was of great uniformity.

The results of measurements are represented by curves of equal anomalies. Some of the profiles measured are shown in figures.

Special attention is drawn by the authors to the following facts observed in this investigation:

1. The measurement of very small magnetic anomalies is possible under the conditions that the number of geological formations is limited by two or not more than three formations and that each of these formations has constant magnetic properties. Under these conditions a sufficient accuracy may be attained without the increase of the price of prospecting per acre.

2. Knowledge of the geology is necessary for the correct interpretation of the magnetic measurements.--W. Ayvazoglou.

ON THE DIURNAL VARIATION OF THE HORIZONTAL COMPONENT OF TERRESTRIAL MAGNETISM (In Russian)

By E.-V. Krakau

Journal of Geophysics and Meteorology,
vol. 5, No. 4, 1928, Leningrad, pp. 295-308

The amplitude of the diurnal variation of the horizontal component is a function of two variables: the number of sun spots and the magnetic latitude of the point of observation. This function is represented by the author in a formula according to which the mean summer amplitudes of the diurnal variation of the horizontal components for different years and for 32 observation stations scattered over the globe were computed. The results of these computations are given in a table and are illustrated by curves. According to the data obtained, the amplitudes of the horizontal component have maximum values at the equator and the poles and minimum values at about 35° of magnetic latitude.--W. Ayvazoglou.

CATALOGUE OF MAGNETIC DETERMINATIONS IN THE U. S. S. R. AND IN ADJACENT COUNTRIES FROM 1556 to 1926

By B. P. Weinberg

Issued by the Central Geophysical Laboratory in Leningrad, 1929, 215 pages.

The catalogue contains about 11,000 determinations on about 8,400 separate stations. The total number of independent determinations is considerably greater, as the points of observation when situated near to each other were joined into one single station. Explanations to the tables are given in the Russian and English languages.--W. Ayvazoglou.

MECHANISCHE INTEGRATOREN ZUR AUSWERTUNG VON BEOBACHTUNGEN AN GESTÖRTEN SCHWERE UND MAGNETFELDERN

(MECHANICAL INTEGRATING DEVICES FOR THE EVALUATION OF OBSERVATIONS MADE UPON DISTURBED GRAVITY FIELDS AND MAGNETIC FIELDS)

By G. A. Gamburzeff

Gerlands Beiträge zur Geophysik, vol. 24, No. 2/3, 1929, pp. 83-93.

Gamburzeff describes how the magnetic and gravimetric observations may be interpreted by means of mechanical devices exclusively. The description of mechanical devices by which the derivation of the magnetic and gravitational potential in case of an infinitely long homogeneous cylinder of any cross section may be established is given. A graphical representation of the whole course of gravity distribution perpendicular to the line of the cylinder envelope can be obtained directly by one of these devices by circumscribing the periphery of the cross section of the cylinder.

Owing to the well-known relationships between the magnetic and gravitational potentials (in case of homogenous magnetization) this apparatus may be used for the geological interpretation of both gravimetric and magnetic observations.

Schematic pictures of the apparatus are added.--W. Ayvazoglou.

ZUR FRAGE DER ERKLÄRUNG DER KURSKER MAGNETISCHEN UND GRAVIMETRISCHEN ANOMALIE

(CONTRIBUTION TO THE QUESTION ON THE EXPLANATION OF THE MAGNETIC AND GRAVIMETRIC ANOMALY IN THE REGION OF KURSK)

By H. Haalck

Gerlands Beiträge zur Geophysik,
vol. 22, No. 3 and No. 4, 1929, pp. 241-255 and 385-399.

The article is divided into two parts. The first part deals with (1) theoretical relations, (2) proceeding of calculations, (3) results of measurements, (4) application of the theory to the results of measurements, and (5) the results obtained by borings. This part is summed up by the author as follows:

"After a detailed discussion of the theoretical relations which exist between the torsion-balance measurements and earth-magnetic measurements the calculations were applied to the geophysical measurements of the Kursk anomaly in the region of Stchigry, which is the most explored one. The calculations were carried on under two different assumptions and the results have shown a sufficiently good conformity.

"It was established that the direction of the magnetization of the deposit ($67^\circ \pm 8^\circ$ inclination in the normal magnetic meridian plane) agrees well with the direction of the normal earth-field in the region concerned ($J_0 = 65^\circ$). The intensity of magnetization was expressed as a function of the density difference $\sigma - \sigma_0$ of the deposit with regard to the surrounding rocks to $J = (0.67 \pm 0.13)(\sigma - \sigma_0)$ in c.g.s. units. On the basis of magnetizability and density of samples obtained by boring, it resulted that the intensity of magnetization was about three to four times greater than would correspond to the effect of the induction of the normal earth field."

In the second part of his article Haalck examines the following problems: (6) General reasons for rock magnetism, (7) the earth-magnetic anomaly of Kiirunavaara, and (8) possibilities for the explanation of the reason of the anomaly of Kursk.

The conclusions drawn concerning the second part of the article are summed up by the author as follows:

"Measurements of local earth-magnetic anomalies made so far, have proved that the direction of magnetization of mass-deposits and complexities of layers corresponds with the direction of the present normal earth-magnetic field. The existing exact calculations, the ratio of values of the measured local disturbances to their causes, as well as the essential physical reasons prove that the intensity of magnetization of geological formations also agrees with the induction of the earth field.

"Calculations made with regard to the magnetic anomaly of Kiirunavaara in North Sweden, the magnetic disturbances of which are somewhat analogous to the Kursk anomaly, have shown that the magnetization of the iron-ore deposit corresponds with a sufficiently good conformity to the induction produced by the earth field.

"The assumption that this rule is correct also for the Kursk anomaly results in the fact that the main cause for the gravimetric disturbances must lie below the iron-quartzite layers reached by borings.

"Considerable objections can be raised against the opinions expressed by Lazareff, Gamburzeff, and Polikarpoff, who consider the causes of anomalies to be entirely explained by the iron-quartzites established by borings, as they lead to assumptions (which are not very probable) on the extension of the deposits by which the magnetization of the deposits can not be explained. Based on the investigations, it results that the real cause of the magnetic and gravimetric anomaly of Kursk must be sought for in a magnetic iron-ore deposit with a high content of magnetite which probably can be found already at a depth of from 500 to 1,000 meters."

Eight figures are given in the article.--W. Ayvazoglou.

HOTCHKISS SUPERDIP: A NEW MAGNETOMETER

By Noel H. Stearn

Bulletin of the American Association of Petroleum Geologists,
vol. 13, No. 6, 1929, pp. 659-677

The purpose of the Hotchkiss magnetometer is to aid in the search for valuable mineral deposits. The history of the instrument culminates in an intensive testing period of two and a half years, during which time it has been tested in the field in Arizona, Mexico, New Mexico, Texas, Oklahoma, Arkansas, Kansas, Missouri, Illinois, and Wisconsin.

In principle the instrument is designed to measure slight variations in the earth's magnetic field. The construction of the superdip is designed to withstand rough field use. Its manipulation has been simplified to the utmost extent commensurate with reliable results. The corrections for very precise work are made by eliminating the effects of temperature, diurnal variation, latitude and longitude. The sources of error, including manipulative, mechanical, and magnetic sources, have been evaluated as closely as possible to date.

The field procedure routine has been evolved to eliminate lost motion.

The application of the instrument to the oil business is exemplified by a picture of the results of a survey made in the Panhandle of Texas, drawn in isometric form.--Author's abstract.

POMIARY NACHYLENIA MAGNETYCZNEGO W OKOLICACH LWOWA W R. 1928

(MEASUREMENTS OF MAGNETIC INCLINATIONS MADE IN THE ENVIRONS OF LWOW IN 1928)

(In Polish)

By Edward Stenz and Henryk Orkisz

Kosmos, vol. 54, Nos. 1 and 2, 1929, pp. 398-430

The present article includes the results of measurements of magnetic inclinations made in 1928 near Lwow. A dip needle was used.

Two hundred and fifty measurements on 242 points of observations were made on an area of 2,250 square kilometers. The average density of points of observations was about 3 kilometers. Their distribution is shown in a map. The results of observations are shown in tables, and a map of inclinations drawn according to these results is given. In examining the map of isanomalies a series of magnetic anomalies, positive and negative, can be established; the highest anomaly is that of a positive intensity equal to 16 minutes along the river of Roztocze, extending from SE. to NW. The topographic influence was very small (± 0.3'), therefore the anomalies were due unquestionably to the tectonics of the subsoil. The authors note that the magnetic anomalies established by measurements agree well with the geological structure of the area under investigation. Further information on the tectonic structure of this area is expected after a more detailed observation is made.--W. Ayvazoglou.

ERDMAGNETISCHE MESSUNGEN IN DER LICHTENWÖRTHER GEGEND UND AM STEINFELDE IN NIEDERÖSTERREICH

(EARTH-MAGNETIC MEASUREMENTS IN THE REGION OF LICHTENWÖRTHER AND NEAR STEINFELDE IN LOWER AUSTRIA)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 21, No. 4, 1929, pp. 373-386.

During investigations made in 1920 in the neighborhood of Wiener-Neustadt with the Eötvös torsion balance, the magnetic declinations and sometimes also the magnetic horizontal intensities were observed at a series of stations. This article contains information on the arrangement of observation results and reduction of them. Magnetic declinations, obtained for the different observation stations, were reduced to a station situated approximately in the center of the region of measurements; owing to this a value of the magnetic declination could be established for this station from the total number of observations; this was important because no such observations were made in this region of measurements for several decades, and besides by this a comparison with the corresponding values given in the well-known Liznar tables was possible also. Suitable approximate values of the horizontal intensity were obtained for the region of measurements, although no careful arrangements for the establishment of them could be made owing to the conditions of time.

The results of a detailed survey of the magnetic declination in the neighborhood of one of the observation stations are given in the form of an appendix.--Author's abstract translated by W. Ayvazoglou.

3. SEISMIC METHODS

EINE EXPERIMENTELLE UEBERPRÜFUNG DER THEORIE DER SCHWINGUNGSMESSER

(AN EXPERIMENTAL CHECKING OF THE THEORY OF OSCILLATION-METERS)

By J. Reutlinger

Gerlands Beiträge zur Geophysik, vol. 24, No. 2/3, 1929, pp. 168-240

Study of the problem of seismographs and oscillation-meters has been carried on by several scientists. On the basis of their results, it has been proved that the single properties of the movement (amplitude of oscillation, velocity, acceleration) can theoretically be determined with great accuracy. On the other hand it also became clear how difficult it is to obtain indisputable records from which the values of these properties of the movement can be derived, based on the theory.

Tests to establish how far the seismographs answer the theoretical calculations were made by Mainka, Galitzin, Geiger, and some others, but thorough discussions on the results of these researches have not been published; besides the oscillation platforms constructed for these tests can not be considered sufficiently accurate for systematic testing of the instruments.

In this article Reutlinger makes an attempt to check the theory of the automatic seismographs experimentally.

According to the author the tests accomplished by him have shown that the present oscillation-meters answer the theory more or less satisfactorily. The correctness of the picture, and therefore the conformity with the theory, was the greater the smaller the friction was in the joints and the friction caused by the writing pin. Thus the conclusion is drawn that oscillation-meters with optical recording are preferable to those with mechanical recording. In the latter case all the friction must be reduced as much as possible. The use of an electric-optical enlargement, especially if the enlargement is to be great, is recommended, as the disadvantages caused by the level connections by gearing may be avoided.--W. Ayvazoglou.

PIEZO-ELECTRIC QUARTZ PLATES

By Charles E. Worthen

The General Radio Experimentor, vol. 4, No. 9, 1930, pp. 1-8

Some information on quartz plates is given for reference when comparing nomenclatures, as there is no standardized terminology so far.

A description of the crystalline quartz used in piezo-electric oscillators is given.

The positions of different axes of a quartz crystal (optic axis, electric axes, mechanical axes) are shown in a figure.

In a table entitled "Common Names Describing the two Usual Cuts for Piezo-Electric Quartz Plates" the different cuts (X-cut, zero-angle cut, face-perpendicular cut, or Curie-cut and the Y-cut, 30° cut, or face-parallel cut) are explained.

Rules which may be helpful for memorizing the location of the X and Y axes and the distinction between the X-cut and Y-cut plates are mentioned. According to the author the crystal is an excellent device for stabilizing the frequency of a vacuum-tube oscillator and when used for this purpose it takes the place of an electrical tuned circuit in determining the frequency of an oscillator. Wiring diagram for a typical piezo-electric oscillator is given in a figure.

Difficulties appearing when the quartz plate is being given its final adjustment and test before being put into use are mentioned.

In the second section of the article Worthen specifies two standardized groupings (types numbers 376 and 276-A) and gives information on frequency ranges and accuracy classification.--W. Ayvazoglou.

4. ELECTRICAL METHODS

DER EINFLUSS DER ANISOTROPIE DER MEDIEN AUF DIE VERTEILUNG ELEKTROMAGNETISCHER WECHSELFELDER VERSCHIEDENER FREQUENZ

(THE INFLUENCE OF THE ANISOTROPY OF MEDIA UPON THE DISTRIBUTION OF THE ELECTROMAGNETIC ALTERNATING FIELDS OF DIFFERENT FREQUENCY)

By Max Müller

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 335-342

Müller describes an electromagnetic method of measurement based on the principle that an alternating current of a low frequency is transmitted without the use of buried electrodes to the anisotropic subsoil by means of induction of an entirely isolated circuit of rectangular shape; the obtained magnetic field is measured inside and outside of the rectangle along three directions perpendicular to one another by means of induction coils, booster, rectifier, and galvanometer. The relation of the components of the magnetic field depends then upon the position and direction of the cables with regard to the main conductive axes of the strata.

The intensity of the magnetic field, in crossing the borders of strata of good conductivity, changes at a certain value depending on the character of the adjoining media.

A tubular transmitter fed by means of a net anode or an oscillatory audion (Schwing audion) has been used as a generator. The sensitiveness of the receiver amounted to 10^{-8} gauss per scale division. Figures showing the geological structure of the object under investigation, the system of connection of the apparatus, the plan of the site, and the curves drawn from the results of measurements are given.--W. Ayvazoglou.

THE PENETRATION OF ROCK BY ELECTROMAGNETIC WAVES AND AUDIO FREQUENCIES

By A. S. Eve, D. A. Keys, and F. W. Lee

Proceedings of the Institute of Radio Engineers,
vol. 17, No. 11, November, 1929,

This paper aims to throw some light upon the much discussed topic of radio penetration and the path of radio waves. Conclusive experimental evidence at the Mammoth Cave of Kentucky, free from all metallic conductors, confirms the hypothesis that radio waves penetrated through the ground and did not follow air openings or conductors. There is further evidence that audio-frequency magnetic fields are not greatly damped through an overburden to 300 feet of sandstone and limestone having a resistivity of about 50,000 ohms per cm^3.--Author's abstract.

ELECTRICAL STUDIES IN DRILL HOLES

By E. G. Leonardon

Mining and Metallugical Society of America,
vol. 22, No. 10, 1929, Bull. 207, pp. 150-155.

The difficulty of electrical methods of prospecting at great depths whenever it is a question of detecting a body of limited size has provoked the scientists to search for means by which the data of investigations may be obtained in a way clearer and easier to interpret. The solution may, to a certain degree, be found when the geophysicist can obtain access to the neighborhood of the mass or of the medium to be studied and can send his electrical current from below.

An example of how this problem may be practically treated is given by a survey in the coal fields of Vensen (Sarre district). The earth connection was made in a drill hole at a depth of 1,000 feet, and the other contact was made on the surface at a distance of 4,000 feet west of the collar of the drill hole.

Another test was made in the Carboniferous formations at Longeville (Lorraine) under a cover at 1,500 feet of Triassic sediments. The work consisted of sending an electrical current into the rocks at the bottom of a drill hole at a depth of 2,920 feet, and then of studying the regions south and west of the hole by means of the equipotential curves.

The next step to be taken is, in the opinion of the author, that of attempting to take the electrical reading also in the interior of the soil. With the technique of the potential methods, this consists essentially of measuring the electrical resistivities of the rocks by lowering appropriate insulated cables into the drill hole so as to make observations at a depth on the rocks in place. This electrical characteristic of the rocks can then be studied all along that part of the drill hole which has not been cased. The results can be presented in the form of a graph on which the resistivities are plotted as abscissas against the depths as ordinates.

Leonardon proposes to call this process "electrical coring" and the graph obtained the "Schlumberger electrical log."

In conclusion the author enumerates the advantages of this electrical coring, which may be briefly summed up as follows:

1. It permits the physicist to carry the exploration along and around the drill hole just as completely as if he were operating the apparatus underground himself.

2. It furnished a quantitative characteristic of the rocks traversed by drill holes.

3. For a given horizon, the resistivity measured in the drill hole at a point some distance from the surface is a much more constant and a better defined parameter than the same one would be if the bed outcropped and the electrical measurements were taken at the surface.

4. The cost per foot of electrical coring is very low when compared with core drilling.

Some cases of practical application of electrical coring with good results are mentioned. This technique has been extensively employed by Schlumberger in field work since 1928; at the present time the total length of holes cored electrically amounts to more than 200,000 feet.--W. Ayvazoglou.

MAPPING SUBSTRUCTURE

By Hans Lundberg

Mining and Metallurgical Society of America, vol. 22, No. 10, 1929,
Bull. 207, pp. 155-160

In this article Lundberg discusses his work on the problem of mapping subsurface structure by means of a new, entirely electromagnetic method.

Of course this method is mainly for use in prospecting for oil and salt, but it might also be of use in finding ore deposits in young bedded formations. The possibility of mapping structures depends upon the difference in conductivity between different beds in the sedimentary column.

The determination of the depth to the conducting bed in case of only one conducting bed, the other beds being very poor conductors, is examined. Diagrams illustrate the results of these examinations.

In the last part of the article Lundberg states that the theoretical problem of calculating the electromagnetic field caused by any number of conducting beds below each other has also been solved and vector diagrams have been calculated which take in the compound effect of several layers.

Surveys of mapping subsurface structures have been carried on in different countries, and the author expresses the hope that he will be able to publish in the near future a number of interesting and very useful results obtained.

The depth which can be reached depends upon the conditions. Lundberg obtained actual results from 1,500 feet, which means that measurements may be taken to any conducting bed within this depth from the surface. About 20 square miles can be covered per month with a prospecting party of two engineers and 10 to 15 helpers.--W. Ayvazoglou.

UNTERSUCHUNGEN UEBER DIE SCHWANKUNGEN DER LOKALEN ELEKTRISCHEN LADUNG DER ERDE

(INVESTIGATIONS ON THE VARIATION OF THE LOCAL ELECTRIC CHARGE OF THE EARTH)

By Rose Stoppel

Gerlands Beiträge zur Geophysik, vol. 21, No. 1, 1929, pp. 116-134.

The variation of the air-electric values (the potential-gradient and the conductivity) correspond with variations of the local charge of the earth which lead to electric currents. The present work gives a method for measuring the relative amount of these fluctuations and also contains some curves which show the daily march of these variations. From these curves it will be seen that the extreme values are observed at midnight and noon and that the electric charge of the earth is more negative during the day, and more positive during the night. The investigations were made partly in Iceland, partly in Hamburg, and in a rural district of the Marn Brandenburg. They all led to the same results. When the sky is overcast the daily variations are smaller and sometimes disappear wholly. Apart from these daily variations the curves show those of longer periods. When it results that the tendency of these curves is parallel to that of the barometrical curves, settled weather can be expected; otherwise an atmospheric change or unsettled weather may come up.--Author's abstract.

KRITISCHE BEMENKUNGEN ZU DER ARBEIT VON B. STOPPEL: "UNTERSUCHUNGEN UEBER DIE SCHWANKUNGEN DER LOKALEN ELEKTRISCHEN LADUNGEN DER ERDE"

(CRITICAL REMARKS ON R. STOPPEL'S WORK: INVESTIGATIONS ON THE VARIATIONS OF THE LOCAL ELECTRICAL CHARGE OF THE EARTH)

By H. Israel

Gerlands Beiträge zur Geophysik, vol. 22, No. 1/2, 1929, pp. 133-137.

Israel draws attention to the errors in Stoppel's article, supporting his declaration concerning the principle that the potential variations of the earth can not be measured. He discusses the possibilities of interpretation of Stoppel's curves by which the diurnal movements of the variations are given, and states that the erroneous interpretation was probably caused by some factors of air-electrical or meteorological origin (see the article above).--W. Ayvazoglou.

DEPTH ATTAINABLE BY ELECTRICAL METHODS IN APPLIED GEOPHYSICS

By A. S. Eve, D. A. Keys, and F. W. Lee

United States Bureau of Mines, Technical Paper 463, 1929, 58 pages.

The authors describe the results of studies performed by them during the summer months of 1928 with regard to the question of the depth attainable in geophysical prospecting. Two results of great importance were established by this summer's work:

1. Confirmation of the Gish-Rooney resistivity method of ascertaining in some localities the presence, depth, and sometimes the thickness of conducting layers far beneath the earth's surface.

2. Introduction of the use of the megger as a simple, available, unpatented method of finding in some localities the presence, depth, and in some instances the thickness of conducting layers beneath the earth's surface (in the present form of the instrument up to 500 or 600 feet).

A region extensively tested by diamond drilling, known as "B. Hill proving grounds," has been selected for the examinations.

The examinations are discussed in the paper under the following headings:

1. Natural currents.

2. Parallel wires.

3. Elliptic polarization.

4. Use and value of direction surveys in electromagnetic loop methods.

5. Vertical loop methods.

6. Electromagnetic induction method.

7. Alternating current induction method at F. Hill, 1928.

8. Earth resistivity and geophysical prospecting:

    A. Theory.

    B. Methods and apparatus.

    C. Field work with the megger at B. Hill.

    D. Comparison of three methods at F. Hill.

The arrangements of the tests accomplished by each method, and the instruments used are described. Conclusions are drawn as to the applicability of each method for geophysical prospecting.

The three methods, those of natural currents with porous pots and microammeter, leapfrog, and megger, are compared.

Investigations accomplished by the authors have proved that a great economy in diamond drilling may be obtained by judicious use of an earth-resistivity survey.

Four appendices are added: (a) Details of field work with megger, (b) artificial bodies, (c) experiments with megger, and (d) new use of megger. Fifty-eight figures illustrate the article.--W. Ayvazoglou.

ZUR THEORIE DES ELEKTRISCHEN FELDES DER ERDE

(CONTRIBUTION TO THE THEORY OF THE EARTH'S ELECTRIC FIELD)

By Teodor Schlomka

Gerlands Beiträge zur Geophysik, vol. 24, No. 2/3, 1929, pp. 241-272.

The fact that atmospheric space is charged with electricity is well known. Calculations concerning the intensities of fields on the ground caused by local and cosmic space charges (Raumladung) have already been made by several scientists; but calculations which could be applied for the case in which the density of the space charge has a universal distribution--that is, when it is a function of the geographic latitude only--are so far not known. Schlomka discusses this question and derives formulas referring hereto. The article is divided into the following four parts:

1. On the influence of the atmospheric space charges (Raumladungen) upon the potential drop on the ground.

2. The diurnal course of the electrical field intensity on the ground.

3. Influence-action of electrically charged spherical zones and spherical caps upon a sphere conductor.

4. Distribution of the charge upon a sphere conductor which is inclosed inside of a conducting envelope and is influenced by the charged spherical zone situated between the sphere and the envelope.

Nineteen figures and many tables accompany the article. A list of literature and a series of notes is added.--W. Ayvazoglou.

ELECTRICAL PROSPECTING FOR ORE AND OIL

By C. T. Tennberg

Chemical Engineering and Mining Review,
vol. 22, No. 255, 1929, pp. 86-90.

Tennberg gives a brief historical sketch of the development of electrical prospecting. Some places in Sweden and in the United States in which this method of prospecting has been applied with success are mentioned.

Neither the scientific aspects nor the theory and particulars of the methods are given.--W. Ayvazoglou.

5. RADIOACTIVE METHODS

EIN TRANSPORTABLES MESSGERÄT FUER SCHWERE IONEN

(A PORTABLE APPARATUS FOR THE MEASUREMENT OF HEAVY IONS)

By Hans Israel

Zeitschrift fuer Geophysik, vol. 5, No. 8, 1929, pp. 342-350.

A portable apparatus for the measurement of the number and mobility of heavy ions is described, and a picture showing the arrangement and the dimensions of the parts of the apparatus is given. The essential advantages are summed up by the author as follows: The dimensions of the apparatus are made as small as possible, the time of measurement is greatly reduced in comparison with that used so far, and, finally, the ions of both signs can be measured at the same time.

Formulas for the conditions to which the dimensions of the apparatus must answer are derived.

The procedure of measurement is given, and diagrams showing the results of the measurements are drawn. In conclusion a table is presented which shows the limits of mobility, calculated for the definite values of the amount of air flowing through per second and for the tension of the condenser, up to which the ions may still be caught.--W. Ayvazoglou.

DAS WESEN DER HÖHENSTRAHLUNG

(THE NATURE OF THE PENETRATING RADIATION)

By W. Bothe and W. Kolhörster

Zeitschrift fuer Physik, vol. 56, No. 11/12, 1929, pp. 751-778.

If two Geiger-Müller's tube-counters are placed close together, a considerable amount of deflection caused by penetrating radiation occurs at the same time in both tube-counters. From the dependency of the position of the tube-counters, as well as from the frequency of these coincidences, the conclusion can be drawn that the penetration of single corpuscular rays through both tube-counters is indicated.

The possibility of absorption of these corpuscular rays was established by putting absorbing layers between the two tube-counters and measuring the decrease of coincidences.

The result was that the corpuscular radiation was absorbed in the same amount as the penetrating radiation itself. Therefore the conclusion is to be drawn that the penetrating radiations, established by the phenomena observed so far, are of corpuscular nature. Their presumable properties are discussed from this viewpoint.--Authors' abstract, translated by W. Ayvazoglou.

7. UNCLASSIFIED METHODS

GEOPHYSICAL PROSPECTING
EDITORIAL NOTE

The Science and Art of Mining, vol. 40, No. 6, 1929, p. 85.

This note concerns the geophysical survey in Australia. The survey is conducted by the Imperial Geophysical Experimental Survey, and its primary object is to make a thorough investigation of geophysical methods of prospecting. The results of this experimental work, which probably will be published next March or April, will put the survey in a position to offer useful data as to the further development of geophysical work within the Commonwealth.

Experiments with gravimetric, electrical, magnetic, and seismic methods are being carried on. The electrical section examined certain zinc ore bodies at Anembo, N.S.W.; the torsion-balance party worked in South Gippsland, Victoria; the latter work was continued by a magnetometric survey and produced interesting results in defining the boundary of the brown-coal basin; copper-ore deposits were studied at Walhalla, Victoria, by the same methods; preliminary investigation by electrical methods had also been carried on in Tasmania on pyrite and pyrrhotite deposits containing a certain amount of tin; another preliminary survey was undertaken in the silver-lead ores of northwestern Tasmania, and an examination was begun on the Ringarooma tin deposits; a gravimetric examination had been made of the deep gold leads of Gulgong, N.S.W.

Application of electrical methods for location of water have been made in the dry areas of the Victorian Mallee country.

A section for seismic work has just been established. The note concludes that in Australia geophysical methods of prospecting are regarded as valuable instruments in the hands of the mining engineers, and the hope is expressed that the information gained by this survey will result in a tenfold benefit to the mining industry.--W. Ayvazoglou.

ANNUAL REPORT OF THE DIRECTOR OF THE DEPARTMENT OF TERRESTRIAL MAGNETISM CARNEGIE INSTITUTION OF WASHINGTON

Reprinted from Year Book No. 28, for the year 1928-29, pages
209 to 276; issued December 12, 1929.

The report contains a summary of the work of the Department of Terrestrial Magnetism covering the time from July 1, 1928, to June 30, 1929.

This work is described under the following headings: (1) Investigational and experimental work (Terrestrial magnetism and electricity and cosmical relations, Research associates and collaborators, magnetism and atomic physics, Experimental work in terrestrial electricity). (2) Field work and reductions (Improvements and cooperation for field and observatory, cooperation with other organizations, Ocean work, Land magnetic survey, Observatory work, Instrument shop). (3) Miscellaneous activities.

A series of abstracts of publications and investigations, as well as a bibliography of contributions, completes the report.--W. Ayvazoglou.

GEOPHYSIK UND STEINKOHLENBERGBAU

(GEOPHYSICS AND THE COAL-MINING INDUSTRY)

By H. Reich

Zeitschrift der Deutschen Geologischen Gesellschaft,
vol. 81, No. 3/4, 1929, p. 173.

This article is a résumé of Reich's lecture delivered by him in Bochum, May 10, 1929:

"The direct geophysical information on the presence of coal may be successful in very few cases only. Geophysics may be useful to the coal-mining industry owing to the fact that it is often possible, by means of various proceedings, to determine from the surface the thickness of the rocks covering the coal, as well as to establish the faults. Certain indications for the discovery of new coal deposits may be obtained from pendulum and magnetic measurements. Coal occurs in valleys (coal basins) which are distinguished by magnetic minima and gravity deficits, as well as in lumps on highlands in which, on the contrary, gravity surplus and magnetic maxima are shown. Deposits of the latter kind only are to be considered for mining in north Germany. Therefore, the main interest is to be concentrated on these deposits."--Abstract translated by W. Ayvazoglou.

INDEX

Page

Anisotropy of media, the influence upon the distribution of the electromagnetic alternating fields of different frequency . . . 16
Audio frequencies, penetration of rock by . . . 17

Belluigi, A. . . . 4
Berger, Ernst . . . 4
Bothe, W. . . . 23
Bowie, William . . . 6

Carnegie Institution of Washington . . . 24
Coal-mining industry and geophysics . . . 24

Department of Terrestrial Magnetism, Annual report of the Director of the 24
Drill holes, electrical studies in . . . 17

Earth-magnetic field, on the measurement of the horizontal disturbance component of the . . . 2
Earth-magnetic investigation in the region of Saint Boès, Lower Pyrénées . 10
Earth-magnetic measurements in the region of Lichtenwörther and near Steinfelde in Lower Austria . . . 14
Earth magnetism, distribution of, our present knowledge of the . . . 8
Earth's electric field, contribution to the theory of the . . . 21
Electric charge of the earth, local, variations of, criticism of R. Stoppel's work . . . 20
    investigations of the . . . 19
Electrical methods in applied geophysics, depth attainable by . . . 20
Electrical prospecting for ore and oil . . . 22
Electrical studies in drill holes . . . 17
Electromagnetic waves, penetration of rock, by . . . 17
Eve, A. S. . . . 17,20

Gamburzeff, G. A. . . . 11
Geoffroy, P. . . . 10
Geophysical prospecting . . . 23
Geophysics and the coal-mining industry . . . 24
Graf, A. . . . 2
Gravity, perturbation of, on the effect of undulations of the geoid upon value of . . . 7
Gravity fields, disturbed, mechanical integrating devices for evaluation of observations of . . . 11
Gravity measurements by means of the reference method with the remote wireless control of the coincidence-apparatus, and the results of the first measurements . . . 4

Haalck, H. . . . 9,12
Hopfner, F. . . . 6,7,14
Horizontal component of terrestrial magnetism, on the diurnal variation of the . . . 10
Horizontal disturbanco component of earth-magnetic field, on the measurement of . . . 2

Page
Induction methods, on the theoretical tilted isoclines and horizontal isodynamics in the 2
Integration devices, mechanical, for evaluating observations of disturbed gravity fields 11
Ions, heavy, measurement of, portable apparatus for 22
Isostasy, in support of the theory of 6
the status and importance of 6
Isostasy and the principal axes of inertia 7
Isostasy and the three-axial figure of the earth 8
Israel, H. 20,22

Keys, D. A. 17,20
Kohlhörster, W. 23
Krakau, E. V. 10

Lee, F. W. 17,20
Leonardon, E. G. 17
Lundberg, Hans 19

Mader, Karl 4,8
Magnetic and gravimetric anomaly in the region of Kursk, contribution to the question of the explanation of 12
Magnetic determinations in the U.S.S.R. and in adjacent countries, catalogue of 11
Magnetic inclinations, measurements made in the environs of Lwow in 1928 14
Magnetic influence caused by rotating masses and the cause of the earth and sun magnetism, on the existence of 9
Magnetometer, a new, Hotchkiss Superdip 13
Mapping substructure 19
Mueller, Max 16

Nippoldt, A. 8

Orkisz, Henryk 14
Oscillation-meters, on experimental checking of the theory of 15

Penetrating radiation, the nature of the 23
Perebaskine, B. 10
Perturbation of gravity, on the effect of undulations of the geoid upon the value of the 7
Phemister, James 2
Phemister, McLintock 2
Piezo-electric quartz plates 16

Reich, H. 4,24
Reutlinger, J. 15
Ries mountains, geophysical problems of the 4
Rotating masses, magnetic influence of, on the existence of 9

Page
Saint Boès, Lower Pyrénées, earth-magnetic investigation in the region of 10
Schlomka, Teodor 21
Scotland, two gravitational surveys in 2
Seblatnigg, H. 2
Stenz, Edward 14
Stoppel, Rose 19
Subterranean masses, calculations on the depth based on gravimetric disturbance 4

Tennberg, C. T. 22

Weinberg, B. P. 11
Worthen, C. E. 16